

REPORT DOCUMENTATION PAGE

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1. REPORT DATE (DD-MM-YYYY)

2. REPORT TYPE

Technical Papers

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5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

5d. PROJECT NUMBER

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MIG2

5f. WORK UNIT NUMBER

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
Edwards AFB CA 93524-7048

8. PERFORMING ORGANIZATION
REPORT

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Research Laboratory (AFMC)
AFRL/PRS
5 Pollux Drive
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10. SPONSOR/MONITOR'S
ACRONYM(S)

11. SPONSOR/MONITOR'S
NUMBER(S)

Please see attached

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

20030129 110

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT

Unclassified

b. ABSTRACT

Unclassified

c. THIS PAGE

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19a. NAME OF RESPONSIBLE
PERSON

Leilani Richardson

19b. TELEPHONE NUMBER

(include area code)
(661) 275-5015

G2

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

14 May 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-118**
C.T. Liu, "Monitoring Initiation and Growth of Crack in a Particulate composite Material Using
Nondestructive Testing Techniques"

2001 Society for Experimental Mechanics Conf.
(Portland, OR, 4-6 Jun3 2001) (Deadline 25 May 2001)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

Comments: _____

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2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

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3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b.) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required

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Signature _____ Date _____

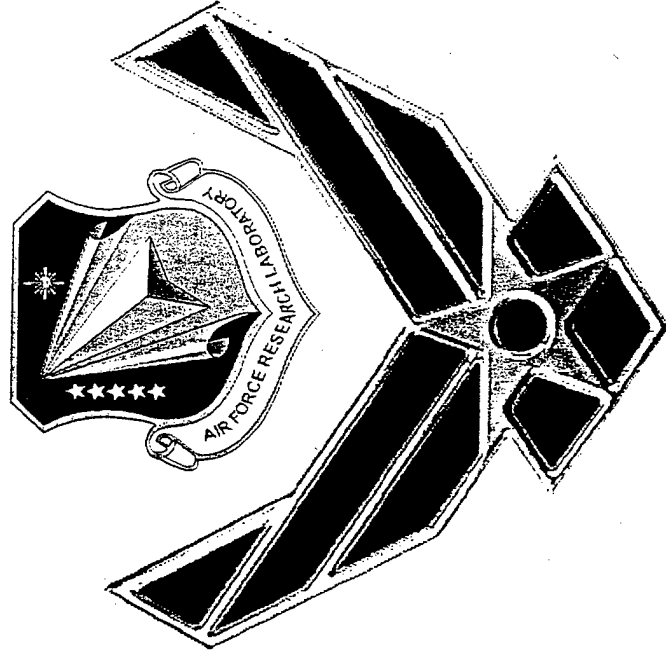
4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

Comments: _____

APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

MONITORING INITIATION AND GROWTH OF CRACKS IN A PARTICULATE COMPOSITE MATERIAL USING NONDESTRUCTIVE TESTING TECHNIQUES

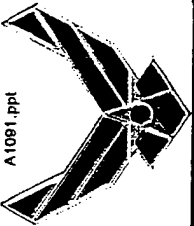


C. T. Liu

AFRL/PRSM

10 E. Saturn Blvd.

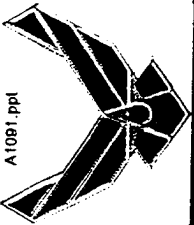
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Objective



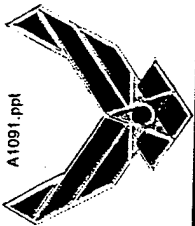
- Investigate Damage Initiation and Evolution and Crack Growth Behavior in a Highly Filled Polymeric Material.



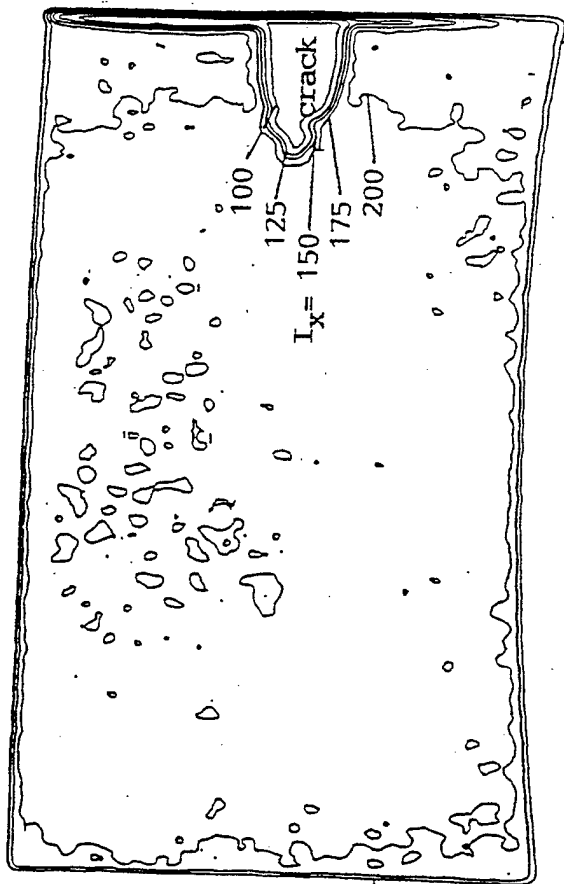
Conclusions



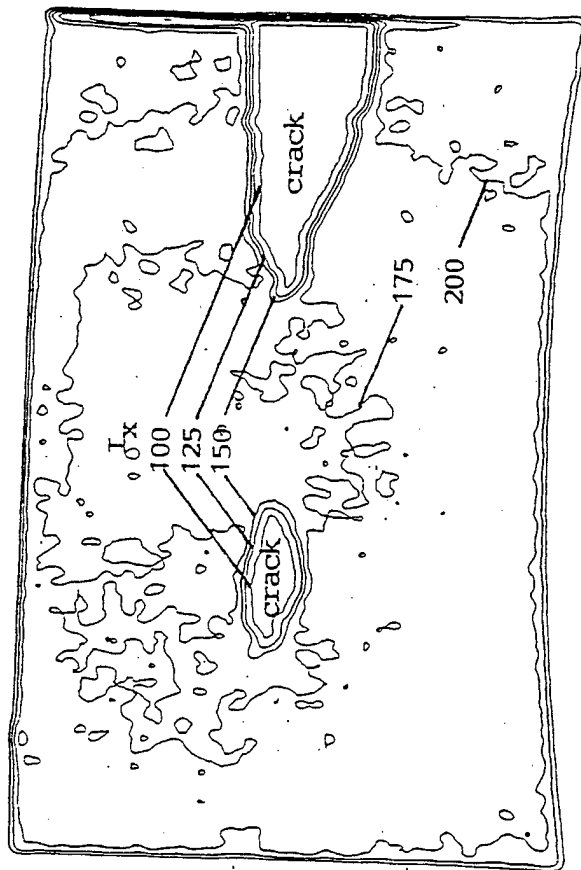
- Real-time x-ray data reveals that damage rate increases rapidly prior to the formation of a crack.
- During the stable crack growth stage, the damage zone size and the intensity of damage increase with increasing time.
- During the unstable crack growth stage, the damage zone size and the intensity of damage decrease with increasing time.
- The results of strain measurement and numerical analysis reveal that the normal strain increases rapidly prior to the formation of a crack.
- The real-time x-ray technique is a promising technique to monitor damage initiation and evolution processes in the particulate composite material.



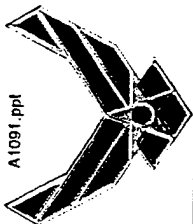
Iso-Intensity Contours of Transmitted X-Ray Energy I_x



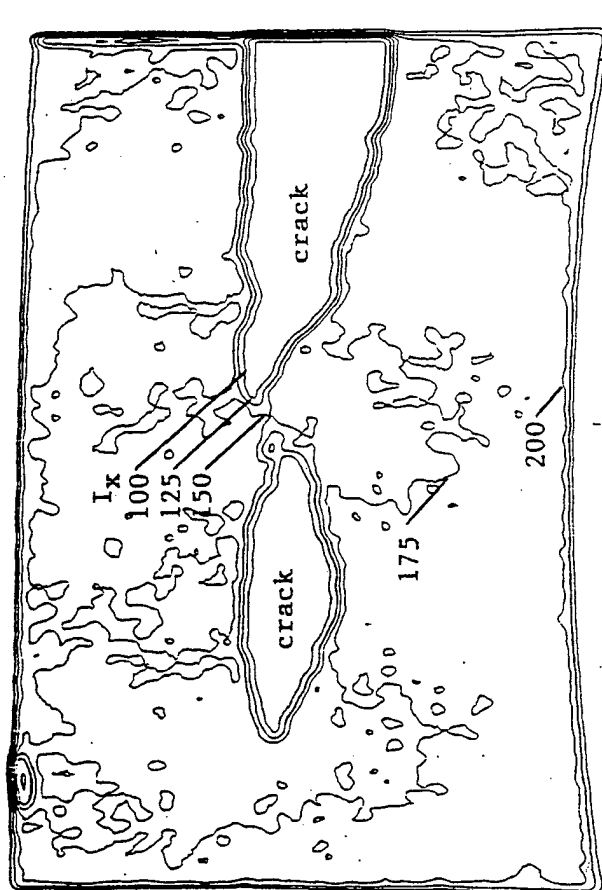
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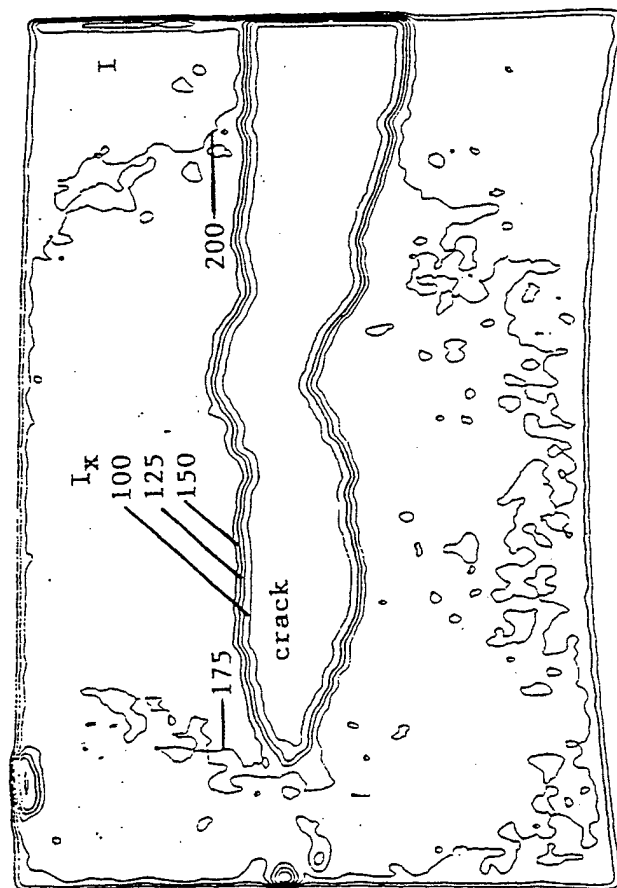
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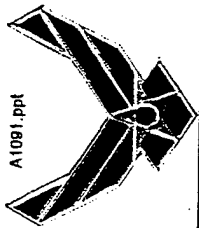
Iso-Intensity Contours of Transmitted X-Ray Energy I_x



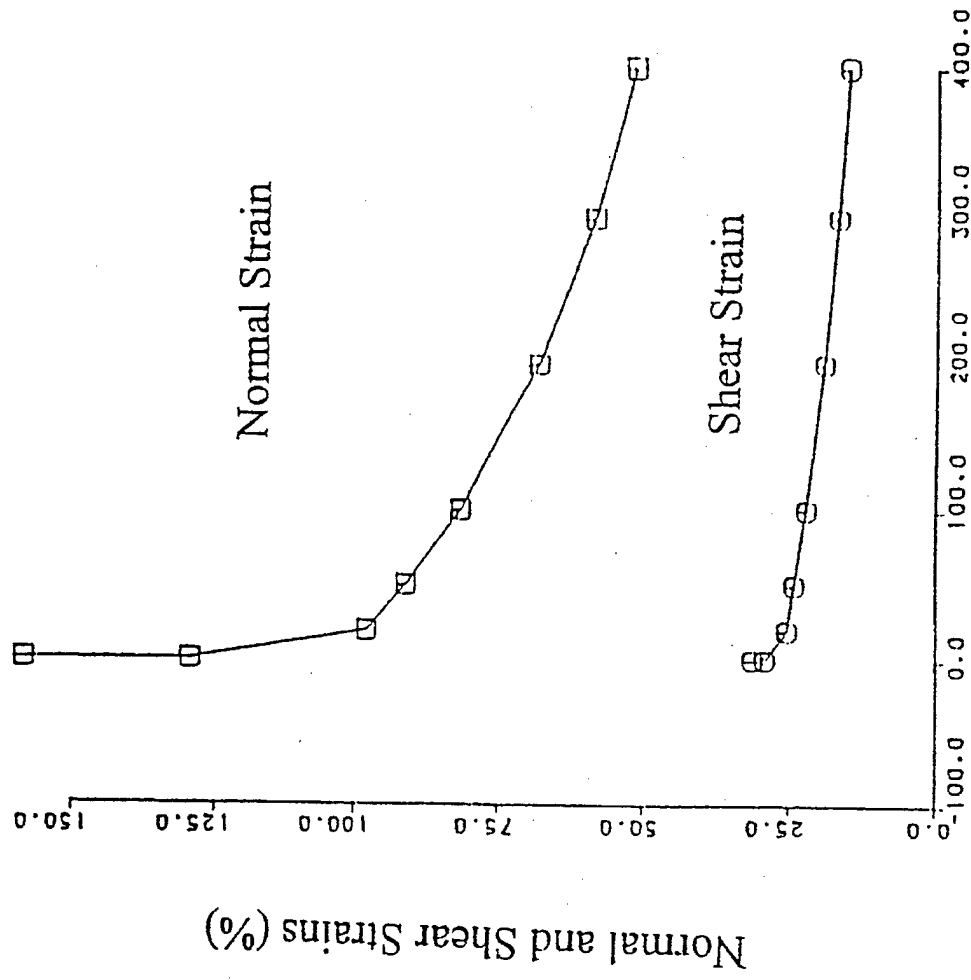
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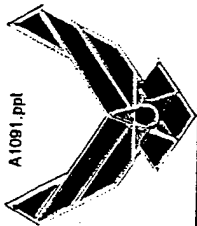
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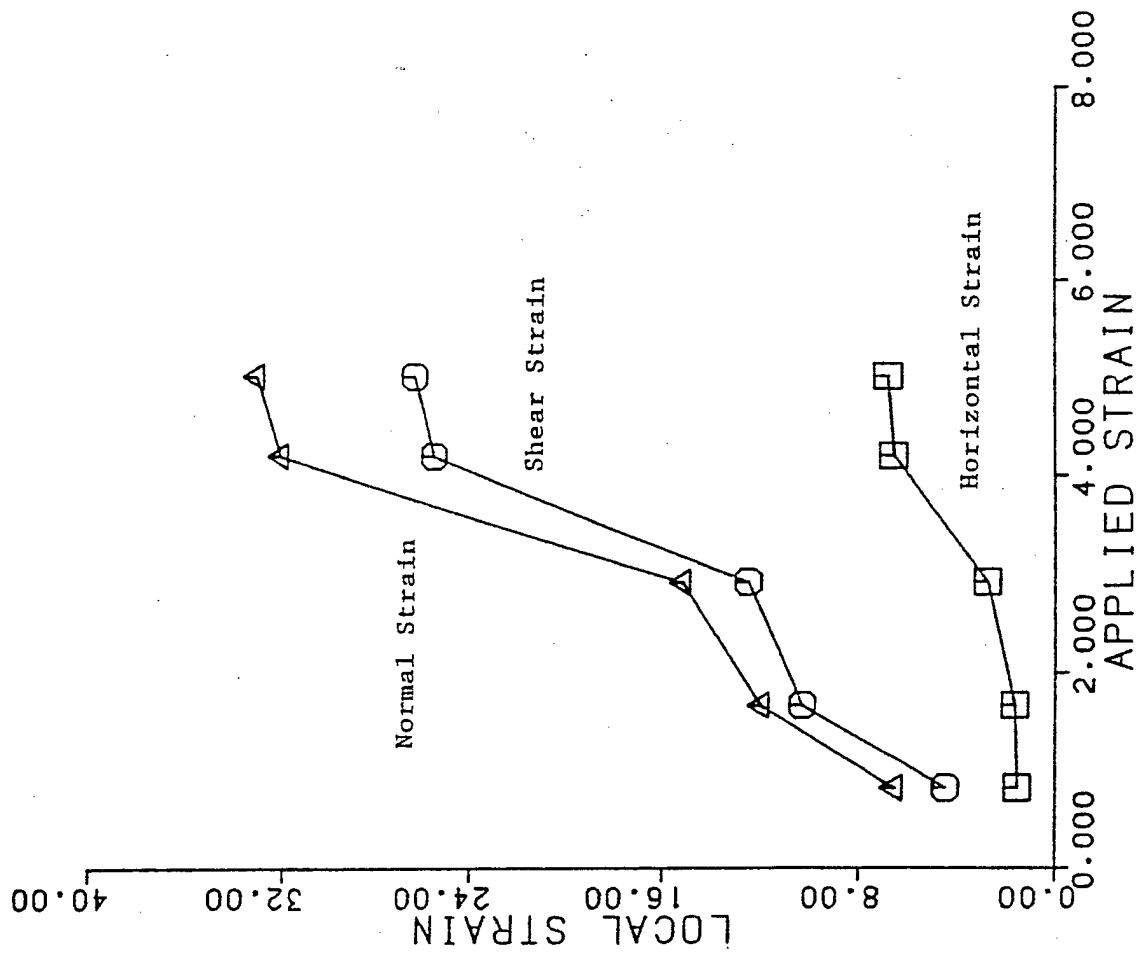
Normal and Shear Strains Versus Young's Modulus

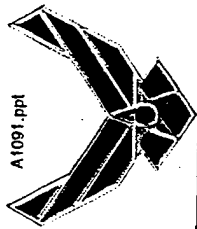


Young's Modulus (145 Mpa)



Local Strain Versus Applied Strain





X-Ray Intensity \bar{I}_x Versus Applied Strain

